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OF THE WEIGHT AND PRESSURE OF THE ATMOSPHERE.

The *Atmosphere*, or air, is an invisible transparent, colorless fluid, which encompasses the earth on all sides. The science which explains the nature and properties of this fluid, is called Pneumatics. The want of cohesion among the particles of this fluid is evident from the freedom with which it is breathed, and from a variety of other circumstances.

The atmosphere possesses weight, or gravitates, like all other matter, towards the centre of the earth. This property of the atmosphere may be shown in many ways, but most satisfactorily by an instrument called the air pump. If we turn a glass tumbler, or a receiver, bottom up—upon the plate of an air pump, and then pump out all the air, the tumbler will be held fast by the pressure of the external air. If we, in like manner, pump the air out of a quart bottle, it will be found to weigh about sixteen grains less than when filled with air. This last experiment proves, not only that the air has weight, but shows precisely how much a quart of that fluid weighs at the common density of the atmosphere. Now, by comparing the weight of a quart of air with that of a quart of water, we find that the latter is about 885 times as heavy as the former; or, that the weight of air is to the weight of an equal bulk of water, as 1 is to 885.

The pressure of the atmosphere upon any given portion of the earth's surface, is equal to the weight of the column of air upon

that portion, extending to the top of the atmosphere. This is very easily ascertained by what is called the Toricellian experiment, which is as follows; let a glass tube three feet long and closed perfectly tight at one end, be filled with quicksilver. Immerse the open end in a vessel of quicksilver without admitting any air into the tube, and hold the tube upright with the open end downwards. The quicksilver will remain suspended in the tube at the height of about 29½ inches above the surface of the fluid in the vessel, at the common pressure of the atmosphere. The suspension of the fluid in this case, is occasioned by the pressure of the atmosphere on the surface of the fluid in the vessel. This may be made evident by placing the whole under the receiver of the air pump. On exhausting the receiver, the quicksilver in the tube will sink down to its level in the vessel; but will rise again on readmitting the air. A tube and vessel of quicksilver fitted as above, with a graduated scale to measure the rise and fall of the fluid in the tube, in consequence of the changes of pressure, is called a *Barometer*.

A column of quicksilver 29½ inches high and one inch square, weighs about 14½ pounds. Fourteen and a half pounds then, is the pressure of the atmosphere upon each square inch of the earth's surface. But the weight of a column of quicksilver, 29½ inches high, is equal to the weight of a column of water of the same bigness about 34 feet high; and, as the water is supported in the barrel of the pump, by the pressure of the atmosphere, precisely as the quicksilver in the tube, the reason becomes obvious, why our common pumps are ineffectual for raising water when the perpendicular height of the piston above the surface of the water exceeds 34 feet.

After knowing the weight of the atmosphere upon a square inch of the earth's surface, it is easy to calculate the weight of the whole atmosphere. In each square foot, there are 144 square inches; and hence, the weight upon a square foot, is 144 times 14½ pounds, or a little more than 2000 pounds. In like manner the weight on a square mile is found to be about six hundred billions of pounds; and the whole surface of the earth being 199,000,000 of square miles, the whole weight of the atmosphere is about 12 quintillions, or twelve thousand billions of billions of pounds.

The pressure of the atmosphere upon bodies immersed in it, is

equal in all directions; that is, the upward and lateral pressure are the same as the pressure downward at a given distance from the earth's surface. This may be shown in several ways. If a glass tumbler, filled full of water and covered with a loose piece of paper, be inverted with the paper on it, the water will be kept from running out by the upward pressure of the atmosphere against the paper. In like manner, if a barrel filled with liquor, be perforated with a small hole at or near the bottom, but tight at the top, the liquor will be kept from running out, by the upward or lateral pressure of the atmosphere. The surface of a middle sized person is estimated at about 14½ square feet. Now, as the atmosphere presses equally in all directions, such a person sustains a constant pressure of upwards of thirty thousand pounds. This may perhaps, seem incredible at first, but when we consider that the pressure is equal on all parts, and that it is counter balanced by the spring of air within, we shall not be so much surprised that the pressure is imperceptible.

It is not to be understood that the pressure of the atmosphere at a given place on the earth's surface is always sufficient to balance just 29½ inches of quicksilver; for the height of the quicksilver at the same place varies from above thirty inches to be below 29 inches according to the density of the atmosphere which is changeable: and hence the use of the barometer in foretelling the weather. The rising of the quicksilver in the tube of the barometer indicates fair weather and its falling indicates foul weather. These hold true in general, but there are sometimes exceptions.

In connextion with this subject may be noticed an error which was formerly very prevalent and which may in some places exist at the present time. Our senses are generally stupid and our bodies languid in proportion as the weather is dull and foggy; and because *we* at such times feel dull and heavy, it has generally been inferred that the *atmosphere* is uncommonly dense and heavy, and that our sensations of heaviness are caused by the great pressure of the atmosphere at such times. But the truth is the reverse of this. The quicksilver in the barometer at such times is low and the vapor, mist and smoke which are wont to float aloft in the atmosphere sink down near the earth's surface, and respiration becomes labored, our senses dull and our bodies relaxed and heavy; all because the atmosphere is not sufficiently dense to afford them

their accustomed support. An animal placed in an exhausted receiver will manifest all those symptoms of lassitude and pressure which have been erroneously supposed to be produced by the uncommon density of the atmosphere.

It is a fact that our bodies feel lightest and our minds most cheerful and vigorous when the air is clear and heavy. Nor should we be surprised at the effects produced upon the human system by the changes of atmospheric pressure; for a middle sized person sustains a pressure from the atmosphere three thousand pounds greater at sometimes than he does at others.

The effect of an equality of atmosphereic pressure may be rendered very sensible by partly closing the hand and keeping the fingers in contact and then swinging it forcibly backward; a peculiar sensation will be felt in the palm which arises from the deficiency of atmospheric pressure in consequence of the rapidity of the motion of the hand and the position in which it is held. The equality of the atmospheric pressure on all sides of a body when the air is undisturbed accounts for the manner in which the most slender and brittle substances sustain it without being broken.

Under the common pressure of the atmosphere water boils at the temperature of 212°; but if this pressure be removed, water will boil at about 92°, which is only the heat of our warmest days in summer. But though water would boil in vaccuo by the heat often experienced in summer yet boiling water would in that case be scarcely lukewarm to the touch since 92° is five or 6° lower than blood heat. These remarks make it obvious why water boils at a lower temperature on mountains than it does in vallies which is well known to be the fact.

From the London Globe.

DEATH OF SIR WALTER SCOTT.

Another great spirit has departed from amongst us. The event, for which the public has been for some time prepared, took place at Abbotsford on Friday. It was a release from a painful semblance of existence alike to the relatives of the illustrious deceased, as it was a delivery from the "mortal coil" to the sufferer himself. The year 1832 has reaped a mighty harvest of the illustrious dead; already had European literature lost Goethe, Cuvier, Bentham, and

Mackintosh; to them is now added Scott, one of the greatest of the great.

Sir Walter Scott was born on the 15th of August, 1771, and consequently died in his sixty-second year He was the eldest son of Walter Scott, Esq., Writer to the Signet, in Edinburgh; his mother was the daughter of David Rutherford, Esq., an able and popular practitioner of the same (the legal) profession. She was the authoress of some poems, and acquainted with Burns, Blacklock, and Allan Ramsay. It is not unreasonable to suppose, that from her he formed his first poetical taste,—another illustration of the assertion, that to our mothers are we mainly indebted for the early bent and ultimate tendency of character.

Sir Walter early discovered a love of poetry and legendary lore, and the fact of his being born lame gave him opportunities of indulging in his poetic fancies. There is an exquisite passage in one of his poetic tales (Rokeby, we think), in which he describes, with all the power which arises from individual feeling, the tendencies of the young poetical mind, such as we may imagine himself to have felt them.

Mr Scott was educated at the High School, Edinburgh, and afterwards served his time to the profession of the law. He was in July, 1792, called to the Scottish bar, and, through the influence of the head of the Scott family, the Duke of Buccleuch, he was nominated Sheriff Depute of Selkirkshire; and in March, 1806, obtained the place of one of the principal clerks of Session in Scotland.

In 1798 he married Miss Carpenter, by whom he has left several children.

The Fox administration confirmed an intended appointment of their predecessors in the person of Mr Scott, without reference to his politics, which were tory, by appointing him to the valuable situation of the Clerk of the Sessions.

The first productions of Mr Scott, were two ballads from the German—"The Chase," and "William and Mary," published anonymously. "Goetz of Berlinchingen," a tragedy, also from the German, appeared in 1799; and about the same time he contributed two ballads, "The Eve of St John," and "Glenfinlass," to "Lewis's Tales of Wonder." His next work was "The Minstrelsy of the Scottish Border," in 1802, which first established his

poetic fame. "Sir Tristram" was published in 1804; this was followed next year by "The Lay of the Last Minstrel;" afterwards succeeded by "Marimon," in 1808; "The Lady of the Lake," in 1810, the most popular of his poetical productions; "The Vision of Don Roderick," in 1811; "Rokeby," in 1812; "The Lord of the Isles," in 1814; and "Waterloo" soon after. These are his principal poetical works. In addition to these Sir Walter published "The Border Antiquities of England and Scotland;" and also edited the works of Dryden, Somers' Tracts, Sadler's State Papers, Miss Seward's works, and those of Swift: he besides conducted the Edinburgh Annual Register.

We need only allude in this brief sketch, to that splended collection of novels, known by the name of the first of them which appeared, the *Waverley* series. No cotemporary author has written so much, and certainly few so well. He created a new world of fiction, founded on the spirit of history rather than its letter; and if he has been guilty of occasional deviations from the beaten path of fact, yet how much is due to one who has made the dry studies of antiquarianism and history both acceptable and delightful.

Sir Walter Scott obtained his baronetcy shortly after the accession of George IV., who paid literature the high compliment of bestowing upon one of its principal living ornaments the first creation of title by the Monarch.

We need not detail the proceedings which arose out of the embarrassment of the northern bookselling company, out of which Sir Walter's pecuniary difficulties arose; it is only necessary to allude to them now as thereout arose the general avowal of that secret which the world had already pretty well made up its mind about,—that Sir W. Scott was the "Great Unknown," the author of *Waverley*.

Last year the venerable poet, under the advice of his physicians, tried the air of Italy for the benefit of his health. While on his way back to England from the sunny climate of the south, he was attacked by a paralytic stroke, which laid prostrate the mighty energies of his mind, and, after a short delay in London, he felt desirous of proceeding to Abbotsford, his home, where he was desirous of breathing his last—a wish that Providence allowed—in the arms of the members of his afflicted family. *Vale! in etrenum vale!*

AUTUMN.

Had we the tender and pathetic expression of Bryant to clothe our musings, we would dwell long and thrillingly upon the lessons taught so forcibly, in the advent of sober-suited autumn. Coldly indeed must he look upon nature and her changes, who does not find a luxury of sentiment in the contemplation of all her seasons. All are but chords to that instrument which yields its tone to every breath of man, and vibrates it voluntarily to every feeling of his breast. In the spring, the fairy melody is made up of the unmingled warbling of rapture, the involuntary trills of untaught fingers, the overflowings of that spring of gladness which gave mythology her table fountains and from which issues all that claims the name of music, short of the voiceless harmony of Heaven. In summer it is mellowed into the harmony of hope. The voice which never mourned is heard in its rich diapasons; its glowing progressions are tempered to the calmness of matured desire; its echoes are unbroken by the irregular responses of untutored passion, and its deep and evervarying consonances chime, swell and estuate, infinite gradation.

Beautifully though sadly the reverse of these is the style of Autumn's "unwritten music." The hope of the glad Spring and the devotion of the ardent Summer, have been damped, but not to deaden a single tone. The chords on which once played the breath of the affections, are strained but not to break. The mind is no longer a mighty organ, yielding its sounds to the hand of man: but becomes a gentle Æolian harp, catching its magic tones from every breath of the autumnal breeze. Plaintive and sweet, as though sound itself had caught a charm from the beautiful hues of decay, they come upon the ear blending into harmony such strains as no art can imitate, no science arrange, no skill record. Such is the music of Autumn, upon the deep-toned, glorious instrument—the heart.

The grave comes gloomily upon the thoughts of youth. They have not yet buried there the better part of their hearts. To the pilgrim who has farther advanced on the highway of human disappointments, the last home of man is a welcome theme. Lovely to him, not only that it already holds his best hopes and his only charms that made the world fair amid all its dessolation, the grave,—the cold and dreary grave sends up a sweet and holy call

to his weary and broken spirit. All that speaks of decay has a charm to him. Not marvel then that he woos the melancholy influence of Autumn, and breathes with untold delight her sighing breezes, and settles an unwearied gaze upon her red and yellow forests. Let childhood hang with enrapturing fondness over the brilliant beauty of Spring's first flowers; but its little idols will wither. Let maturer youth yield its full devotion to the fruitful and fervent hopes of Summer; yet they too shall pass away. But who, that has ever relished the calm yet passionate love of fading beauty which steals upon the unsubdued though softened spirit of one whose hopes have been like the summer cloud, will cling to such fleeting hues again. There is an autumn in his soul, where all these images are deep and indelible.—Even the winter of age, though it withers the outer form, can never supplant the sweetly lingering hues of autumn in the soul. They cling to the memory longer than hope,—and the memory itself is life. *Traveller.*

BORROWING.

There is no class of people more annoying in a community than those who are eternally in the habit of *borrowing*–who through extreme parsimony, neglect to provide themselves with the various articles, which are considered indispensable in a well regulated family, and subsist almost entirely at the expense of their neighbors. But it is a notorious fact, which we dare say many of our readers will bear witness to, there are many families, who seem to make it the chief business of their lives *to borrow.*

"My dear," said Mrs Green to her husband one morning, "the meal which we borrowed from Mr Black a few days ago is almost out, and we must bake tomorrow."

"Well," said her husband, "send and borrow half a bushel at Mr White's, he sent to mill yesterday."

"And when it comes, shall we return the peck we borrowed more than a month ago, from the widow Gray?"

"No," said the husband gruffly, "she can send for it when she wants it. John do you go down to Mr Brown's, and ask him to lend me his axe to chop some wood this forenoon; our's is quite dull, and I saw him grinding his last night. And James do you

go to Mr Clark's and ask him to lend me a hammer—and do you hear? you may as well borrow a few nails while you are about it."

A little boy now enters and says, "Father sent me to ask if you had done with his hoe which you borrowed a week ago last Wednesday; he wants to use it."

"Wants his hoe child? What can he want with it? I have not half done with it yet—but if he wants it, I suppose he must have it. Tell him to send it back, though as soon as he can spare it."

They set down to breakfast. "O la!" exclaims Mrs Green, "there is not a particle of butter in the house—James run over to Mrs Notable's, she always has excellent butter in her dairy, and ask her to lend me a plateful."

After a few minutes James returns; "Mrs Notable says she has sent you the butter, but begs you to remember that she has already lent you *nineteen* platefuls, which are scored on the dairy door."

"Nineteen platefuls!" exclaimed the astonished Mrs Green, holding up both her hands; "it is no such thing—I never had *half* the quantity: and, if I had, what is a little plateful of butter? I never should think of keeping an account of such a trifling affair—I declare I have a great mind never to borrow any thing of that mean creature again as long as I live."

After breakfast Mr Green must shave. His razor is out of order—"John, where is Mr Smith's hone and strap?"

"He sent for it the other day, sir, and said he should like to have the privilege of using it himself *sometimes*."

"Sent for it? Impertinent! He might at least have waited till I was done with it. Well, go down to 'squire Stearn's, and ask him to lend me his best razor; tell him mine is so dull I can do nothing with it. I know he has an excellent one—for I saw him buy it last week at Mr Grant's store. Be sure and get the new one."

A little girl enters—"Mother sent me to see if you had done with *the second volume of Milman's History of the Jews*, which you *borrowed* of her several months ago. She says, she would like to read it herself."

"My dear child, why did not your mother send for it before? I declare I dont know where it is now. I lent it to somebody—I

forget who! I'll make enquiry, and if I can find it, I will send it to her in the course of a few weeks."

In the afternoon it rains—"Wife where is my great coat?"

"My dear, your great coat has got two great holes under the arm pits; besides it is so shabby I am ashamed to see you wear it. Can't we borrow one somewhere? Here James, go to Deacon Davis' and ask him if he will lend your father his new surtout, as it rains, and his is not fit to wear. He will take good care of it, and return it when he is done with it." And so on to the end of the chapter.

A friend once informed us, that about ten o'clock, one cold stormy evening in the month of February, when his family was about retiring for the night to their respective apartments, a loud rap was heard at the door, which on being opened there entered a little urchin, who said his mammy, who lived but a few paces distant, had sent her respects, and wished to *borrow a warming pan* to warm her bed, as the night was cold, and they had none in the house. The warming pan was forthwith brought from the kitchen and handed over to the little fellow; but he was not yet satisfied—"Mother says if you lend us the warming pan, perhaps you would lend us some *coals* too, to put into it, as our fire is almost gone out!"

The mendicant who humbly solicits alms at your gate, tells you that he is the child of poverty—and his squalid features and filthy rags confirm the tale. You cheerfully render him all the assistance in your power, conscious that virtue sometimes dwells beneath a tattered garb. The highwayman, who knocks you down, and then summons you to stand, gives you a convincing, though rather unwelcome proof, that however degraded the wretch may be from the absence of virtue, yet *courage* still ennobles his heart. But the *borrower* does not possess one redeeming—But we will command our temper. *Traveller.*

From Dr Ware's Introduction to Semllie.

GENERAL REMARKS ON THE STRUCTURE OF VEGETABLES.

In considering plants and animals with a view to the description of their structure and organs, there is one remarkable circumstance worthy of attention at first, viz. that—while the animal kingdom

exhibits a great variety between different classes in respect to the perfection, completeness, and complexity of their structure, and the number of their functions; so that a regular series is formed, ascending from the lowest and most imperfect worm possessed of no faculties but those of feeling and moving up to quadrupeds with all their wonderful and varied powers—the vegetable kingdom on the contrary exhibits but little of this sort of variety. Plants are nearly all alike with regard to the organs they possess and the functions they perform. On the one hand, the polype and the elephant, do not differ from each other more in size, than they do in the number and complexity of their organs, and the extent and perfection of their powers and functions. Whilst, on the other hand, the humblest moss is scarcely less perfect, less complicated, or possessed of less extensive powers, than the most lofty tree. Vegetables vary in their form, their size, their fruit, and many other particulars; but we cannot say of one, that it is of a higher order in the scale of creation than an other, as we can of animals. There is no series beginning at an individual of low and obscure powers, and ending in one of powers numerous and elevated.

The structure of plants is exceedingly simple and nearly alike in all the different classes, so far as they have been examined. The important parts, which serve to provide for their nourishment and growth, are the root, the stem, and the leaves. These are all formed of a variety of vessels and tubes, in which the sap and other fluids circulate. The sap is in the first place taken into the roots, probably by means of the long fibrous filaments which are usually extended in every direction, and conveyed into what are called the *central vessels*. These are so called from their being arranged, in annual shoots and herbaceous plants, around the pith or centre of the stem. They are constructed of fibres which are wound spirally around them and are thence sometimes called the spiral vessels. This arrangement probably contributes to the motion of the fluids they contain. By these vessels the sap is carried up the stem and distributed to the different branches, and thence to the leaves, flowers, or fruit. In the leaves it circulates and is there exposed to the influence of light, heat, and air; and is no doubt perfected and elaborated by the processes which it undergoes. Returning from the leaves, it descends in a different

set of vessels situated thein bark, and in its descent contributes to the growth and nourishment of the plant by depositing new layers of vegetable matter between the bark and the stem.

This is the course of the circulation in annual plants, where there is an entirely new growth every year from the root. But in trees and shrubs where the same trunk or stem continues from year to year, the arrangement, though essentially the same, is a little varied. The central vessels are not situated directly around the pith, but in the external layer of wood called the *alburnum* which is always the growth of the preceding year, and performs this office only for one season, being afterwards surrounded and enclosed by a new layer of the same kind. Hence the trunks of trees are formed by layers of wood, which have been yearly deposited around the centre, and have successively afforded a passage for the sap, by means of the central or spiral vessels, to ascend into the branches and leaves. From the leaves the sap descends through the vessels of the internal layer of the bark, as in the former case, and in its descent gradually contributes to the formation of the alburnum for the next year. That part of the bark, also, which has thus once served the purposes of circulation, like the alburnum, is afterwards thrown aside, and its place is supplied by a new layer formed on its inside between it and the alburnum. Hence the large quantity of thick and dead bark which is often accumulated upon the outside of the trunk and branches of old trees.

This is a slight sketch of some of the most important points in the vegetable circulation. It appears from this, that the principal seat of the growth and nutrition of plants is in the bark and alburnum, and that all the new matter yearly added, is deposited on the outside of the latter and the inside of the former—that the growth of one year is only subservient to the circulation of the next, and is ever afterwards of use merely in giving strength and stability to the trunk in order to support the increasing size and weight of the branches, leaves, &c. The wisdom and beauty of this provision, by which that portion of the plant, which has become useless for every other purpose, is thus made to answer a very important end, are sufficiently obvious; and it is rendered necessary by the circumstance that plants do not like animals arrive at a definite size and there cease, but go on growing to an indefinite

extent, and consequently require corresponding increase of strength in those parts which are to support them.

But besides this circulation, which is the most important and interesting part of the vegetable economy, and is also the best understood, the fluids of plants are, no doubt, subjected in different parts to a variety of operations, and undergo many changes. There are many other vessels besides those already mentioned, whose office is not perfectly known, but which contribute probably in some way to the elaboration of the different principles found in plants, such as gum, resin, sugar, &c. or are subservient to the performance of their functions. The difficulty of accurately examining the minute structure and organization of vegetables is very great, and it is probable that we shall always remain ignorant of many highly important parts of their physiology.

It appears from this account, that those parts of plants, which perform the functions necessary to their nutrition and growth, are strictly annual. So that all plants are either annual, that is, wholly renewed every year, or at least have the circulating vessels, and all the organs taking an active part in their economy, annually renewed, viz. the alburnum, the bark, the leaves, the flower, &c. This circumstance affords another very obvious general distinction between the vegetable and animal kingdoms; in the latter, nothing of the kind is to be observed; there is in no case such a renewal of any of the organs of which an animal is composed,—any at least of those concerned in performing inportant functions. It is true that some of the subordinate parts, such as the hair, the cuticle or scarf skin, the nails, teeth, feathers, &c. are occasionally and sometimes annually renewed in certain kinds of animals. But there is no change in any of the principal organs; the circulating system, the lungs, the stomach, &c. always remain the same.*

* It may here be observed, that in vegetables there is none of that absorption of the different parts which takes place in animals. The matter of which they are composed, being once deposited, is never taken up again; whilst in animals there is a constant process going on, by which the old matter is taken away and new deposited, and the organs thus renewed. Perhaps this end is intended to be answered in vegetables by the annual renewing of their circulating system.

For the Green Mountain Repository.

REMARKS UPON THE DIRECTION AND USE OF THE MAGNETIC NEEDLE.

Mr Editor,

Having noticed your invitation in the October number of the Repository, I take the liberty of sending you a few observations on the subject of the variations in the direction of the magnetic needle, at different times and in different places, since that phenomenon was first discovered.

When or by whom magnetism was first discovered and brought into use, is not certainly known. It was evidently in use as a guide at sea as early as A. D. 1150.

The first writer of note on this subject was Doctor Gilbert, who wrote about the year 1600, since which it has been a subject of much investigation.—It is not my object in this paper to enter at all into the subject of preparing magnets, but to show in some degree how far, and in what manner, the magnetic needle may be relied on as a guide either by sea or land.

It is evident from the best information, now to be obtained, that for a considerable time after the magnetic needle was used as a guide, it was supposed to range itself exactly with the meridian, or due north and south; but after it became in more general and extended use, it was found to vary from the true meridian, and, on further examination, it was found to vary differently in different places, and on yet further investigation it was found that the variation was not stationary in the same place. The first record we have of the variation is given by Ferdinand, son of Columbus, who states that his father discovered a variation A. D. 1492.

In attempting to account for the different and continued variations, much has been written at various times and by various authors, each of whom has formed his own hypothesis, and thereon made his calculations, but time and observation has proved the fallacy of them all.

Among those who have attempted to form a theory, from which to calculate not only the present, but all future variations throughout the Globe, may be considered Doctor Hooke and Doctor Halley, who both published their lucubrations in the seventeenth century.

The latter of whom, after procuring the result of observations made in different parts of the world, formed a variation chart which was intended as a guide to mariners; this, with others of the

same kind, went out of use on account of the continued and unexpected variations. Attempts were then made to account for these continued and unequal variations. To do this, various magnetic points were supposed to exist, both in the northern and southern hemispheres, at certain distances from the poles. Some of these points were supposed to be fixed in the earth and some in the heavens. Their attractions, repulsions, and preponderances were all considered with regard to location and distance, and from these data, theories have been deduced and calculations made thereon for future variations, all of which have turned out equally fallacious.

This has led me to believe, that if the Author of the universe has intended that we should know the cause, either of the attraction of the magnetic needle, or of its multifarious, continual, and irregular variations and changes; the time has not yet arrived for its developement.

We must therefore content ourselves with such information as we are permitted to obtain, and rather marvel that man has acquired so much, than that more yet remains which he may, or may not understand; and though on the subject under consideration, there are many things which are mysterious, yet enough is known to answer all practical purposes. This assertion will be further illustrated hereafter. At present I will give a list of some of the variations which have been observed at different times and different places. In order to this, it must be noted that when the north point of the needle points to the east of due north, it is called eastern variation, and when it points to the west of due north, it is called western variation; and when the needle exactly coincides with the true meridian it is then said to be at Zero, or to have no variation.

In giving a list of variations I will begin with London, which is situated in latitude, 51 degrees 31 minutes, N. and longitude 0 degrees 5 minutes west from the observatory at Greenwich. The earliest record we have of the observed variation at this place, is in A. D 1580, at which time the variation was 11 degrees 15 minutes E in 1612, it was 6 degrees E. in 1634 it was 4 degrees 5 minutes E. in 1657 it was at Zero, in 1672 it was 2 degrees 30 minutes W. in 1723 it was 14 degrees 17 minutes W. in 1747 it was 17 degrees 40 minutes W. in 1780 it was 22 degrees 41 minutes W

and in 1793 it was 24 degrees 30 minutes W. making the difference in the direction of the magnetic needle 35 degrees 45 minutes in 213 years.

At Paris, latitude 48 degrees 50 minutes N. and longitude 2 degrees 20 minutes E. the observed variation commences A. D. 1550 and was then 8 degrees E. in 1660 it was at Zero, in 1681 it was 2 degrees 2 minutes W. in 1760 it was 18 degrees 20 minutes W. and in 1804 it was 22 degrees 20 minutes W. making a difference of 30 degrees 20 minutes in 254 years.

At Dublin, latitude 53 degrees 22 minutes N. longitude 6 degrees 17 minutes W. the observed variation commences A. D. 1657 and was then at Zero. In 1791 it was 27 degrees 23 minutes W. making a difference of 27 degrees 23 minutes in 134 years.

At the south point of Africa, latitude 34 degrees 53 minutes S longitude 20 degrees 10 minutes E. the magnetic needle was at Zero in 1600, in 1692 it was 11 degrees W. in 1700 it was 10 degrees W. in 1791 it was 24 degrees 32 minutes W. being a variation of 24 degrees 32 minutes in 191 years.

At the island of St Helena, latitude 15 degrees 55 minutes S. longitude 5 degrees 51 minutes E. in 1660 it was 8 degrees E. in 1692 it was 1 degree W. in 1776 it was 13 degrees 15 minutes W. in 1794 it was 16 degrees 16 minutes W. being a variation of 24 degrees 16 minutes in 194 years.

At Cape Comorin, being the south part of Hindoostan, latitude 7 degrees 50 minutes N. longitude 77 degrees 32 minutes E. in 1620 the variation was 14 degrees 20 minutes W. in 1688 it was 7 degrees 30 minutes W. in 1756 it was 0 degrees 15 minutes W. and in 1816 it was at Zero, varying only 15 minutes in the last 60 years, and 14 degrees 5 minutes in 136 years next previous.

At Cape Horn, latitude 55 degrees 58 minutes S. longitude 67 degrees 21 minutes W. in 1683, the variation was 23 degrees 10 minutes E. in 1775 it was 24 degrees 23 minutes E. in 1786 it was 22 degrees 47 minutes E. and in 1795 it was 23 degrees E.

From all these observations it appears that although the needle varies so much, yet, there was no material difference in variation for the space of 112 years.

Along the coast of China, Corea, Tartary and Kamtschatka, the variation has not been known to be over 2 or 3 degrees and

in many places less; some at Zero, and some on one side of the meridian and some on the other.

The greatest variations have been observed in the voyages made to near the Arctic pole.

The variation there continued to increase until in some instances it was 110 degrees, so that the north end of the needle took a direction 20 degrees south of a line drawn east and west.

In North America, though few observations have been made, yet enough is known to ascertain that the same uncertainty prevails here as elsewhere.

At Harvard University situate at Cambridge in the state of Massachusetts, latitude 42 degrees 23 minutes N. longitude 71 degrees 8 minutes W. some observations have been made, but with what degree of accuracy I am not informed, the result of which is as follows. In 1702, the variation was 9 degrees W. in 1747 it was 8 degrees W. in 1751 it was 7 degrees 20 minutes W. in 1763 it was 7 degrees 14 minutes W. in 1772 it was 7 degrees W. in 1782 it was 6 degrees 46 minutes W. which shews a difference of only 2 degrees 14 minutes in 80 years.

In the overland voyage of Sir Alexander McKenzie to the mouth of McKenzie's River in 1789, in latitude 70 degrees N. longitude 135 degrees W. the variation was 36 degrees E.

At sea in Baffins Bay latitude 52 degrees N. longitude 52 degrees W. the variation was 40 degrees 11 minutes W. and in latitude 60 degrees N. and nearly the same longitude, it was 52 degrees W.

The monument at the source of the River St Croix, on the line between the State of Maine and the British province of New Brunswick, is in latitude 45 degrees 53 minutes N. longitude 67 54 west. In the years 1817 and 1818, John Johnson, principal surveyor on the part of the United States, under the 5th article of the treaty of Ghent, run the line due north to 48 degrees north latitude, which line divides the State of Maine from the said province of New Brunswick.

The variation of the needle at the monument in 1817 was 14 degrees west, and at 48 degrees north latitude, in 1818, it was 17 degrees 45 minutes west.

In Vermont, as no meridian has been kept up for any considerable length of time, it is not to be expected that a very particular

knowledge of the variation of the needle could have been obtained. It is however supposed that from the south west to the north east corners of the state the needle will now range variously from six to ten degrees of west variation.

At the University of Vermont at Burlington at the present time, the variation is 8 degrees 20 minutes west, and comparing the needle now with some well known lines which were run soon after the Revolutionary War, the course of which lines, by the needle have been ascertained at several times since, the following result was obtained. That is, in 1785, the variation was 6 degrees 35 minutes west, in 1805, it was 5 degrees 35 minutes west and in 1832, it is 8 degrees 20 minutes west.

The surveys in the State of Vermont probably commenced as early as A. D. 1750, and perhaps before that period. The town and lot lines were mostly run in the south and east parts of the state before the Revolutionary War, and some surveys bordering on the lake were probably commenced during the same time. Soon after the close of the Revolutionary War the remaining town lines were mostly run, and as early as 1810, the towns in this state were nearly all divided into lots.

This business, which was sixty, or seventy years in progress was performed by the use of the magnetic needle, without any reference to the variation or the difference of variation during elapsed time.

The instruments made use of were generally, and perhaps unavoidably, of an inferior quality, incorrect and inconvenient in their construction, and frequently in bad repair, and those who used them, except in a few instances, were incompetent, wanting in information both in theory and practice as well as in a knowledge of proper instruments, or of keeping them in due repair.

The country being new, lands cheap, and labor and provisions dear, induced the owners of lands to have their business done in the cheapest way, and the want of any test or standard of examination, either of men or instruments, caused those to be employed, who in most cases, were totally incompetent, and their instruments unsuitable.

The consequence of this state of things is what might be expected. Lines considered and intended to be parallel, frequently vary from one to four or five degrees, and crooks and curves are frequently to be found in lines, which can only be attributed to the

causes before stated. Lots intended and reputed to be of the same size, are in many instances so varied that one is twice as large as another in the same vicinity. In consequence of this irregularity, when lines and corners are gone, the records, where there are any, instead of being a sure direction by which to renew the lost boundary in its original place, will lead to a very different result. This at once throws the whole neighborhood into a ferment, and a long inveterate law-suit, is the consequence, in the course of which all in the vicinity take sides, and mutual calumny and slander take the place of mutual harmony.

In this situation it is continued in the law as long as either party is able to pay the cost, and in the end each is deprived of his property and reputation, if not of his liberty.

I have now commented on the original surveys and made some observations on the consequences of their irregularity. Surveys however, continue to be made, and must so continue as long as the right of property is acknowledged by law, and business transactions shall continue; and unless they are made in a more correct manner than has heretofore been and now is usual, they will surely continue to be one of the most fruitful sources of law-suits within our country.

Our laws require that the legislature shall annually elect a surveyor general, and that the county court in each county shall appoint county surveyors. It is not, however, required that they should have any scientific acquirements, or practical knowledge in their business, or instruments suitable to perform such business with accuracy.

And here let me observe, and it is a lamentable fact, that in general there is no knowledge in the appointing power, of the proper qualifications of the persons appointed. And further, that suitable instruments are not within the requirements of the law, and consequently do not legally make any part of the question.

The low ebb to which this business has been suffered to fall, has nearly excluded from it all science, and consequently appointments if made at all under our present system, must be made from such materials as are to be had.

(To be continued.)

METEOROLOGICAL

BURLINGTON, Vt., Lat. 44° 27′. Long. 73° 14′. Altitude above Lake

1832. NOV.		Thermometer. S. R.	1 P.M.	9 EV.	Barometer. S. R.	1 P.M.	9 EV.	RAIN Inch's	Winds. Morning.	Noon.	Evening
1	5	47	61	57	29.50	29.25	29.10		S.	S.	S.
2	6	47	49	40	29.30	29.30	29.15	.07	N. W.	N. W.	N. W.
3	7	39	47	33	29.85	29.70	29.65		N. W.	N. W.	N. W.
4	G	44	54	53	29.50	29.30	29.30		S.	S.	S.
5	2	44	41	34	29.50	29.50	29.75	.20	N. W.	N.	N.
6	3	33	45	36	29.75	29.25	29.30		N.	N.	S.
7	4	41	40	30	29.25	29.45	29.65		S.	N. W.	N. W.
8	5	25	34	23	29.75	29.70	29.65	.08	N. W.	N.	N.
9	6	28	33	36	29.45	29.35	29.25		S. W.	S.	S.
10	7	38	46	42	29.25	29.10	29.10		S.	S.	S.
11	G	40	39	30	29.25	29.30	29.50		S.	N.	N.
12	2	27	46	44	29.45	29.25	29.20		S.W.	S.	S.
13	3	39	52	39	29.20	28.90	28.90		S′.	S′.	W″.
14	4	26	29	20	29.25	29.40	29.60		W″.	W′.	W.
15	5	19	26	17	29.70	29.80	29.90		N. W.	N. W.	N.
16	6	22	35	34	29.85	29.80	29.85		S′.	S′.	S′.
17	7	34	41	44	29.75	29.65	29.50		S′.	S.	S.
18	G	44	46	42	29.35	29.25	29.25	.51	N.	N.	N.
19	2	39	48	50	29.25	29.20	28.95	.96	N.	N.	S.
20	3	42	38	19	28.90	29.50	29.75		W.	W.	N.
21	4	13	27	27	30.05	29.90	29.85	.27	N. E.	N. E.	N. E.
22	5	32	37	34	29.65	29.45	29.35		S.	S.	S.
23	6	32	40	32	29.20	29.25	29.25	.75	S.	S.	W.
24	7	25	33	27	29.35	29.20	29.45		N.	W.	N. W.
25	G	23	32	32	29.60	29.70	29.70		S.	W.	S. W.
26	2	33	38	38	29.60	29.45	29.30		S.	S.	S.
27	3	40	38	33	29.25	29.35	29.50	.17	S.	S.	W.
28	4	32	44	42	29.50	29.40	29.35		N.	S.	S.
29	5	32	26	23	29.60	29.70	29.75		N.	N.	N.
30	6	27	28	21	29.65	29.50	29.45		N.	N.	N.
MEAN		33.2	39.4	34.1	29.47	29.40	29.48	3.01	Gen'l mean Ther. 35.6		

JOURNAL.

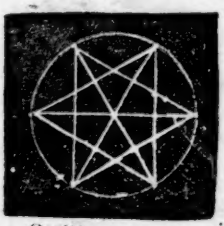
Champlain 250 feet. Distance from the Lake, one mile East.

D.	Weather. Morn.	Noon.	Even'g.	Remarks.
1	*Fair*	*Clear*	*Cloudy*	Very smoky. }
2	*Cloudy*	*Cloudy*	*Fair*	Smoky. } Indian Summer.
3	*Cloudy*	*Clear*	*Clear*	Smoky. }
4	*Cloudy*	*Cloudy*	*Fair*	Smoky. }
5	*Cloudy*	*Cloudy*	*Cloudy*	
6	*Cloudy*	*Cloudy*	*Rain*	
7	*Cloudy*	*Cloudy*	*Fair*	Squally.
8	*Cloudy*	*Clear*	*Clear*	A little snow.
9	*Fair*	*Cloudy*	*Snow*	
10	*Fair*	*Fair*	*Cloudy*	
11	*Cloudy*	*Cloudy*	*Clear*	Squally.
12	*Clear*	*Clear*	*Clear*	Smoky
13	*Clear*	*Clear*	*Cloudy*	Smoky. Evening squally.
14	*Clear*	*Fair*	*Clear*	
15	*Cloudy*	*Fair*	*Fair*	Brilliant Aurora Borealis in concen-
16	*Cloudy*	*Fair*	*Clear*	[trive arches.
17	*Clear*	*Clear*	*Rain*	
18	*Rain*	*Rain*	*Rain*	Foggy all day.
19	*Cloudy*	*Cloudy*	*Rain*	Foggy.
20	*Cloudy*	*Snow*	*Cloudy*	
21	*Clear*	*Clear*	*Clear*	
22	*Cloudy*	*Cloudy*	*Snow*	
23	*Cloudy*	*Cloudy*	*Cloudy*	4¼ inches of snow. }
24	*Clear*	*Cloudy*	*Fair*	} Sleighs run.
25	*Fair*	*Fair*	*Fair*	Snow squalls. }
26	*Cloudy*	*Cloudy*	*Rain*	}
27	*Cloudy*	*Cloudy*	*Cloudy*	Snow nearly gone.
28	*Cloudy*	*Cloudy*	*Cloudy*	
29	*Cloudy*	*Fair*	*Cloudy*	
30	*Snow*	*Snow*	*Snow*	

Barometer, 29.45 inches.

Additional remarks.—By the foregoing table, it appears that the mean temperature of November, this year, was 35.6 degrees, which is 3.3 colder than Nov. 1828, and 2.1 degrees warmer than the mean of Doct. Saunders' observation. Range of thermometer from 13 to 61 deg. Mean height of barometer 29.45 inches. Range of barometer from 28.90 to 30.05, equal 1.05 inch.

Solution of the questions in No. 10.



1. A grove consisting of nineteen trees, in nine straight rows, with five trees in each row.

2. To find the time divide 15 inches by 39.2 inches, the length of a pendulum vibrating seconds, and the square root of the quotient omitting smaller fractions is .6 seconds for the time of one vibration, and $.6 \times 9 = 5.40$ s. the whole time. Then

$\sqrt{73088 \times 5.4 + 1304164} - 1142 = 161.3$ and $161.3 \times 161.3 \div 64 = 406.52$ feet the depth of the well, and $406.52 \div 1142 = .34$ s. time of the sound's ascent, and $5.4 - .34 = 5.06$ time of the stone's descent. *See Thompson's Arithmetic Part III. Section* 3.

Solution of Question 37, *page* 147. *Thompson's Arithmetic.*

Question. Suppose a pole 100 feet high, to be 24 inches in diameter at the ground, and 4 in. do. at the top; and a vine $1\frac{1}{2}$ inches in diameter at the ground, to run up this pole, winding round every 3 feet, and gradually diminishing so as to come to a point at the top of the pole, what is the length of the vine?

End Diameters { 24 in + 4in ÷ 2 = 14 mean diameter of the pole. 1.5 in + 0 is ÷ 2 = .75in do. of the vine.

Then 14.75 in. diameter of the mean cylinder around which the vine winds, and 1 : 14.75 : : 3.1416 : 46.3386 the circumference described by the vine's centre.

Then $\overline{46.3386}^2 + 36^2 = 3443.26584996$ and $\sqrt{3443.26584996} = 58.6783$ inches the length of vine required to go once round, or for 3 feet of the pole (See Repository pp 142). Then 3 : 58.6783 : : 100 : $1955.94\frac{1}{3}$ in = 162 feet, $11.94\frac{1}{3}$ in. Ans.

Question. **There is an upright cone 20 inches high, if it be divided into three equal parts by sections, parallel to the base, what will be the height of each part?**

SUMMARY.

Population of the principal towns in Great Britain, including their suburbs, in 1801, and 1831.

Towns.	1801.	1831.
London	864,845	1,474,069
Manchester	94,876	237,832
Glasgow	77,385	202,226
Liverpool	79,722	189,244
Edinburgh	82,560	162,403
Birmingham	73,670	142,250
Leeds	53,162	123,893
Bristol	63,645	103,886
Shieffield	45,755	91,692
Plymouth	43,194	75,534
Portsmouth	43,461	63,026
Norwich	36,832	61,116
Aberdeen	27,608	58,019
Newcastle	36,963	57,937
Paisley	31,179	57,466
Nottingham	28,861	50,680
Hull	34,964	49,461
Dundee	26,084	45,355

From this table it appears that the population of the large towns in Britain has, on an average, very nearly doubled within the last 30 years; and, as the increase of the whole population in town and country in that time is only 51 per cent. the true increase in the country when the towns are absratcted is about 25 per cent. At that rate it would require 120 years for the country population to double.

Indian Inquiries.—An Indian passing through the woods one day, stopped before a man who was chopping wood, and surveyed him with great gravity. He remarked that every time the man brought the axe to the log, he sent forth a sound something like "*ugh*," as if that was part of the operation. "Why you speakem *ugh* when you bring your axe down?" said he.—The man laughed; "O, it makes me chop faster."—"Ah! does it? Why you no say *ugh* too when you take him up—then you chop twice as fast."

A profitable job.—An Irish tailor who had made a gentleman's coat and waistcoat too small, had orders to take them home and *let them out*. Some days after, the gentleman inquiring for his garments, was told by the Irishman, that the coat and waistcoat happening to fit a countryman of his, he had *let them out* at eighteen pence a week.

Query.—Is it more disagreeable to have no appetite for your dinner, or no dinner for your appetite?

A Bull.—Lord Byron says' "The batteaux of Switzerland are sometimes *manned* by women."

Good advice.—It is better to tread the path of life cheerfully, skipping lightly over the thorns and briars that obstruct your way, than to sit down under every hedge lamenting your hard fate. The thread of a cheerful man's life spins out longer than that of a man who is continually sad and desponding. Prudent conduct in the concerns of life is highly necessary,—but if distress succeed, dejection and despair will not afford relief.

Candor.—It is one of the strongest sophistications of artificial life, that men are more candid with their enemies than their friends. Whilst the former are sure to hear their faults and foibles exposed in the most candid manner, the latter are left to keep them, or find them out as they may.

Memory.—Men often complain of short memories—yet how seldom do they forget the slightest circumstance of the slightest injury!

POETICAL DEPARTMENT.

FROM THE TRAVELLER.

I *WAS* ALONE.

I always was a lonely thing,
And yet I know not why—
My mother used to fondle me,
And beg me not to cry;
My father too would take me up
And kiss the tear away,
Then call me his best little girl,
And bid me go and play;
Yet still I could not feel like those
Who laugh till childhood 's gone,
For spite of me the tears *would* come—
And *then* I felt alone.

I had a little brother too,
On whom my heart was set,
Who,—when full oft in summer time
The morning flowers were wet,
And birds were happy in the trees
High up above the dew,
Before the sun came stealing down
With his rich, golden hue,—
Would take me by the hand, and speak
His love in *such* a tone,
That none but a poor simple girl
Could feel she was alone.

We'd ramble from the cottage door
Along the narrow lane,—
Then up into the green oak-grove
That looks across the plain,
To where the gelid fountain springs,
And sports the livelong day,
Or gives its music to the night
And the pale lunar ray:
And on the pebbly bed that with
Its own bright beauties shone,
We'd sit and gaze;—'twas then I felt
That I was all alone.

Youth passed with me—and as it passed
The cloud that first hung light,
Grew darker as it floated on,
And settled down in night;
The stars that glimmered through the gloom
All, one by one, went out,
And cold and melancholy then
Was every thing about;
My mother, father, brother—all,
To the damp grave had gone,
And I was left to weep, and feel
I was indeed alone.

A beam to bright too be of earth
Broke from its birth-place, heaven—
And flashed upon a soul that long
With its own griefs had striven;
And in a voice so soft, so sweet,
So eloquent with love,
The whispered invitation came,
Seraphic from above,—
The conscious cloud soon floated off,
And toward his adiant throne,
I've learned to bend my eyes, and feel
I am not *all* alone.

F. S.

THE LONGEST DAY.

BY WORDSWORTH.

Summer ebbs;—each that follows
Is a reflux from on high,
Tending to the darksome hollows
Where the frosts of winter lie.

He who governs the creation,
In his providence assigned
Such a gradual declination
To the life of human kind.

Yet we mark it not;—fruits redden,
Fresh flowers blow as flowers have blown,
And the heart is loath to deaden
Hopes that she so long hath known.

Be thou wiser youthful maiden!
And when thy decline shall come,
Let not flowers, or boughs fruit-laden
Hide the knowledge of thy doom.

Now, even now, ere wrapt in slumber,
Fix thine eyes upon the sea
That absorbs time, space, and number,
Look towards eternity!

Follow thou the flowing river,
On whose breast art thither borne
All deceived, and each deceiver,
Through the gates of night and morn:

Through the year's successive portals;
Through the bounds which many a star,
Marks, not mindless of frail mortals,
When his light returns from far.

Thus when thou with Time hast travelled
Towards the mighty gulf of things,
And the mazy stream unravelled
With thy best imaginings:

Think, if thou on beauty leanest,
Think how pitiful that stay,
Did not virtue give the meanest
Charms superior to decay.

Duty, like a strict preceptor,
Sometimes frowns, or seems to frown,
Choose her thistle for thy sceptre,
While thy brow youth's roses crown.